John H. Bryant. *Heinrich Hertz: The Beginning of Microwaves.* 51 pp., illus. New York: Institute of Electrical and Electronics Engineers, 1988. $15 (paper).

It was just over one hundred years ago that Heinrich Hertz first demonstrated the existence of electromagnetic waves, and this important centennial has been widely observed, notably by the Institute of Electrical and Electronics Engineers and its associated Microwave Theory and Techniques Society. John Bryant, a research scientist at the University of Michigan, took a leading role in organizing the IEEE/MTTS commemorative exhibit, which was built around a set of replicas of Hertz's apparatus loaned by the Science Museum in London. The present small book grew out of this project and is essentially a catalogue of the exhibit.

After brief sections on the background of Hertz's work and on the provenance of his surviving apparatus and its replicas, the main body of the book is devoted to a well-illustrated chronological account of the experiments themselves. Bryant's familiarity with microwave techniques helps him to bring out several interesting points and to catch a significant error in the way the original apparatus (now at the Deutsches Museum in Munich) and its replicas have been displayed: at some point, probably in the 1920s, the dipoles of the transmitters and receivers were mounted backward in their reflectors, making them easier to see but rendering the devices inaccurate and unworkable.

The demands of brevity and the tight focus of the book on particular experiments and pieces of apparatus prevent Bryant from giving any sustained analysis of the state of German electrodynamics in the 1870s and 1880s or of the relationship between Hertz's work and that of such British physicists as G. F. FitzGerald, Oliver Lodge, and Oliver Heaviside. This might leave the misleading impression that Hertz's experiments spoke for themselves and that their broader significance was clear to all concerned from the start. The evidence in fact indicates that Hertz did not at first grasp the real meaning of James Clerk Maxwell's theory or the relation his own experiments bore to it, and that it was largely through the favorable response of British physicists in the latter half of 1888 that his work came to be seen as a great confirmation of Maxwell's theory. As Heaviside observed to FitzGerald early in 1889, after reading an account of Hertz's experiments, "I see that Hertz is not a Maxwellian, though he is learning to be one."

Bryant closes with a brief account of the last years of Hertz's short life and a chronology of his main experiments and publications. Twentieth-century scientists and scholars will note with some envy that most of his papers appeared in print within a month or two of being submitted.

BRUCE J. HUNT